

**REVIEW OF THE LIMATULUS-SETOSUS GROUP OF
THE GENUS ENDALUS IN AMERICA NORTH OF
MEXICO (COLEOPTERA: CURCULIONIDAE)¹**By HORACE R. BURKE²

While studying the curculionid fauna of Texas it was found that at least seven of the eight species of *Endalus* Laporte known from America north of Mexico occur in the State. Study of these local species along with the discovery of some apparently reliable taxonomic characters not previously used prompted this review of a portion of the genus with descriptions of two new species. Future plans include a more complete treatment of the entire genus.

Sincere appreciation is expressed to the following persons for loan of material and for other favors: Miss Rose Ella Warner, Entomology Research Division, U.S.D.A., (U.S. National Museum); Dr. Henry F. Howden, Canada Department of Agriculture, (Canadian National Collection); Dr. Leland Chandler, Purdue University; and Dr. Vasco M. Tanner, Brigham Young University. Additional specimens for study consisted of those in the collection of the Entomology Department, A. & M. College of Texas, and in the author's collection.

The genus *Endalus* Laporte 1840, in America north of Mexico, has received little attention since the treatment by LeConte (1876) of six species, five of which he described as new at that time. Blatchley (1916) dealt with those species occurring in north eastern America and described an additional new one from Florida. Tanner (1943) presented a key to the species known from America north of Mexico.

Little is known concerning the biology of members of *Endalus* except that they are usually found on plants around water. Available records indicate that at least three species are definitely associated with plants of the genus *Scirpus*. A few species have been taken in numbers at lights.

Endalus in America north of Mexico may be readily separated into two rather distinct groups. Although the conservative approach of considering these as species groups is followed here, study of additional material, especially South American species, may well prove that these groups deserve subgeneric status. These two

¹ Technical contribution No. 3598, Texas Agr. Exp. Sta., A & M College of Texas, College Station.

²Assistant Professor, Department of Entomology.

groups may be separated as follows:

(1). *Limatulus-setosus* Group. Paired, pad-like scales (Figs. 5, 6) between tarsal claws; second tarsal segment at most only slightly wider than first, the two usually equal in width; tarsal claws widely divergent, moderately separated at base; eyes rounded, height of eye always distinctly less than two times width; length, 2.5-5.5 mm.

(2). *Ovalis-laticollis* Group. Without pad-like scales between tarsal claws; second tarsal segment distinctly wider than first; tarsal claws never widely divergent, narrowly separated at base; eyes transverse, height of eye usually about two times width; length, 1.4-2.8 mm.

A review of the *limatulus-setosus* Group is the subject of the present study. The *ovalis-laticollis* Group, containing *Endalus ovalis* LeConte, *E. punctatus* LeConte, and *E. laticollis* Blatchley, will be treated later when more material is available and when a study can be made of the type series of each. This latter group at present is in a rather confused state, with probably no less than five good species being included under the three names now recognized.

All species of the *limatulus-setosus* Group possess paired, pad-like scales between the bases of the claws on the ventral side of the fourth tarsal segment. A search of the literature has failed to reveal previous mention of these rather conspicuous scales in *Endalus*, or in any other curculionids. These scales of *limatulus*, *robustus* and *disgregus* n. sp. are somewhat elongate with plumose margins and may be either separated or contiguous. In some examples the two median scales are flanked laterally by shorter ones, while in others the lateral scales are absent. The latter condition is apparently brought about by rubbing since poorly preserved specimens have been examined which lacked all of the scales on one or more tarsi. Rose Ella Warner (*in litt.*) has informed me that the type of *robustus* has paired scales on the fore and middle tarsi, but only a straight row of scales on the hind tarsi. All other species of the *limatulus-setosus* Group have paired scales on all tarsi. *Endalus setosus*, *aeratus*, *cribicollis* and *celatus* n. sp. have oval scales which are much more conspicuous than the elongate ones described for the three species above.

Additional characters common to all species of the *limatulus-setosus* Group are: Rostrum rather stout, slightly to moderately curved; scrobes short, descending to reach underside of rostrum some distance before eyes; suprascrobal groove extending from above antennal insertion posteriorly to open against front margin of eye. Antennae slender; scape gradually enlarged in apical third,

not reaching eye; funicle 6-segmented, segment 1 obconical, segment 2 shorter, slender, segments 3-6 each shorter than 2, all approximately equal in length and becoming progressively broader toward club; club elongate-oval. Eyes coarsely faceted. Prothorax wider than long (except *celatus*). Humeri prominent, rounded. Elytra emarginate at base, distinctly wider than prothorax, apex broadly rounded to somewhat obtusely pointed. Fore coxae contiguous. Abdominal sterna 1 and 2 approximately equal in length, first suture broadly arcuate at middle, sterna 3 and 4 shorter, equal in length, sternum 5 along midline as long as 3 + 4. Tibiae each with a preapical tooth and a stout apical spine. Tarsal segment 3 deeply emarginate, segment 4 usually projecting slightly past lobes of 3.

All measurements reported herein were made with an ocular micrometer. The length of the rostrum was measured from a side view along a straight line from the apex of the rostrum to the point where it joins the underside of the head. The total length of the body was determined from a dorsal view by measuring along the midline from the anterior margin of the eye to the apex of the elytra. All other measurements were made at the point of greatest width or length of the structure in question.

KEY TO SPECIES OF THE LIMATULUS-SETOSUS

GROUP IN AMERICA NORTH OF MEXICO

1. Setae on head, prothorax and elytra long, conspicuous; prominent swelling at base of rostrum before eyes (Fig. 1)

celatus, n. sp.

 Setae on head, prothorax and elytra short, at most only moderately conspicuous; without swelling at base of rostrum . . . 2
2. Prothorax with lateral edges expanded (Fig. 2)

setosus LeConte

 Prothorax more rounded in cross section 3
3. Paired, pad-like scales between tarsal claws oval (Fig. 6); hind tibia never denticulate along inner margin; length, 2.1-3.2 mm. 4

Paired, pad-like scales between tarsal claws elongate, with plumose margins (Fig. 5); hind tibia (except *robustus*) with a few stout denticles along inner margin; length, 3.6-5.5 mm. 5
4. Eyes large in comparison to size of head (Fig. 4); rostrum of both sexes short; elytral setae stout, abundant; elytral scales brassy in color *aeratus* LeConte

- Eyes small in comparison to size of head (Fig. 3); rostrum of female longer; elytral setae remote, inconspicuous; elytral scales gray and brown, never brassy . . . *cribicollis* LeConte
5. Prothorax densely, finely punctate; rostrum rather slender, moderately curved; hind tibia with a few stout denticles along inner margin (these denticles may be entirely hidden by scales) 6
- Prothorax coarsely punctate; rostrum stout, scarcely curved; hind tibia without row of denticles along inner margin
robustus Schaeffer
6. Third tarsal segment distinctly wider than second; tarsal claws stout; length, 4.5–5.5 mm. *limatulus* (Gyllenhal)
- Third tarsal segment more slender, only slightly wider than second; tarsal claws slender; length, 3.6 mm.
disregus, n. sp.

Endalus celatus, n. sp. (Figure 1)

Holotype male: Length, 2.6 mm.; width, 1.1 mm.; width of pronotum, 0.74 mm.; length of pronotum, 0.74 mm.; length of rostrum, 0.59 mm.

Elongate-oval; derm of body and appendages reddish-brown, covered by dense coating of brown scales and long, slender, inclined to recurved setae.

Rostrum straight, tapering slightly from base to apex, with dorsal prominence at base before eyes; closely, coarsely punctate except for smooth, shining apex; basal two-thirds of rostrum covered by coat of dense scales which do not completely obscure punctation; conspicuous, bristle-like setae along dorsal surface of rostrum arranged in four poorly defined longitudinal rows, each lateral row extends onto front of head along upper anterior margin of eye. Supra-scorbal groove only feebly evident, almost completely covered with scales. *Antennae* inserted immediately before middle of rostrum; funicular segment 1 stout, as long as next three segments combined, segment 2 shorter, approximately as long as 3 + 4, segments 3–4 equal in length, becoming slightly broader toward club; club large, obtusely pointed at apex, almost as long as funicle. *Eyes* oval, very feebly convex. *Prothorax* rounded in cross section, as long as wide; sides slightly diverging from base to widest portion just before middle, thence rounded to feeble subapical constriction; pronotum with coarse, contiguous punctures evident through the dense coating of scales; slender, inclined to recurved setae on pronotum with apices generally turned inward toward midline. *Scutellum* oval, small and inconspicuous. *Elytra* 1.4 times wider, 2.3 times longer than

prothorax; humeri rounded; sides of elytra parallel in basal three-fifths, thence converging to rounded apex; dense coating of elytral scales are brown except for a white spot of scales at base of intervals 4 and 5 and on suture at beginning of declivity; intervals convex, transversely rugose, each bearing a single row of long setae, each seta being erect in its basal half then strongly bent, the apices of all elytral setae projecting posteriorly; striae wide, deeply impressed throughout. *Underside* clothed as above except that brown color is somewhat mottled with gray. Femora and tibiae slender, bristling with long, gray setae which are less strongly curved than those on body. Tarsi stout, squamose, setose, with pair of oval, pad-like scales between claws at apex of last tarsal segment. Tarsal claws stout, widely divergent.

Type material: Holotype male, College Station, Brazos Co., Texas, 20 April 1960 (H. R. Burke), to be deposited in Collection of Entomology Department, A. & M. College of Texas. This specimen was taken while sweeping sedges and other plants at the edge of a pond. Extensive collecting in the same area before and after the capture of this specimen failed to produce additional material.

Remarks: *Endalus celatus* is a very distinctive species and may be readily separated from any known member of the genus by the prominent setae on the body. This new species is most closely related to *aeratus* which it resembles in several respects. Other than the prominent setae mentioned above, the two may be separated by the smaller and less convex eyes, and the dorsal prominence at the base of the rostrum (lacking in *aeratus*) of *celatus*. In addition, *celatus* lacks the brassy scales characteristic of *aeratus*.

Endalus aeratus LeConte

Endalus aeratus LeConte, 1876, p. 176.

Length, 2.4–3.2 mm.; width, 1.0–1.3 mm.

This species is rather easily recognized by the brassy color of the elytral scales; no other known species of *Endalus* has scales of this color. However, the extent of the brassy tint varies somewhat, being more evident in some specimens than in others. Other distinctive characters for *aeratus* include large, rounded eyes, coarsely punctate prothorax, and stout rostrum. *Endalus aeratus* is definitely more closely related to *setosus* and *celatus* n. sp. than to other members of the *limatulus-setosus* Group. This affinity is evident in the possession by all three of oval, pad-like scales between the tarsal claws, the very widely divergent claws (much more so than in other members of the group), the narrow lobes of the third

tarsal segment, and the more abundant setae on the body.

Records taken from label data indicate that *aeratus* has been occasionally collected on a variety of plants such as cotton, willow, carrots, alfalfa and beets. Material obtained for study from the U. S. National Museum included an envelope containing 54 specimens and labeled in part "Woodland, Calif., swept from *Scirpus fluviatilis*". The large number of specimens taken from this particular species of plant strongly indicates that it represents at least one of the true hosts of *aeratus*.

Endalus aeratus was described from Texas and is now known to be widely distributed west of the Mississippi River. A total of 122 specimens has been examined from the following localities: *United States*. CALIFORNIA—Downey; 20 mi. S. Fresno; Sacramento; Woodland. COLORADO—Alamosa. IDAHO—Caldwell. KANSAS—Hamilton Co. NEVADA—Elko. OREGON—Portland; Hood River. TEXAS—Brazos Co.; Brownsville; Cameron Co.; Dimmit Co.; Donna; Floyd Co.; Gillespie Co.; Lubbock; Lynn Co.; Pharr; San Benito; San Diego; Taft; Zavala Co.; Nueces River. *Canada*. ALBERTA—Lethbridge.

Endalus setosus LeConte

Endalus setosus LeConte, 1876, p. 176; Blatchley and Leng, 1916, p. 223.

Length, 3.5–5.0 mm.; width, 1.5–2.2 mm.

The expanded lateral edges of the prothorax (Fig. 2) and abundant, recurved setae on the body are distinctive features of this species. The sexes are easily distinguished by the color pattern on the elytra. In the male the scales on each elytron are rather uniformly brown from the suture through interval 8, gray on intervals 9, 10, 11, with a white spot of scales at base of interval 4 and on suture at middle of length of elytra. The general color pattern of the elytra of the female consists of dark brown scales on the basal third of intervals 2 and 3, behind which is a broad, rather vague V-shaped pattern with an arm extending diagonally forward across first six intervals of each elytron. The scales elsewhere on the elytra are light brown or gray except for white ones in a spot at the base of interval 4, on suture near beginning of declivity, and sometimes in scattered spots on intervals.

Although *setosus* is frequently collected around lights in Texas, nothing is known concerning its biology.

It should be noted here that the last paragraph of LeConte's description of *setosus* actually belongs with *limatulus*, (LeConte,

1876, Appendix, p. 417). Therefore, the statement by LeConte concerning distribution "Middle States not rare; Kansas, Texas" refers to *limatulus* and not *setosus*. I have not seen specimens from localities other than in Texas and Louisiana. Sixty-two specimens, including the type in the Museum of Comparative Zoology, have been examined from the following localities in these two states: TEXAS—Anderson Co.; Brazos.; Brownsville; Cotulla; Cuero; Hidalgo Co.; Kingsville; Taft; Weslaco; Winter Haven. LOUISIANA—"La."

Endalus cribicollis LeConte

Endalus cribicollis LeConte, 1876, p. 177; Blatchley and Leng, 1916, p. 224.

Length, 2.1–3.0 mm.; width, 0.9–1.3 mm.

Endalus cribicollis is not common in collections. The outstanding characters of this species are the small eyes, very coarsely punctate prothorax and the slender rostrum of the female. The eyes (Fig. 3) are much smaller in comparison with the size of the head than those of any other species of the *limatulus-setosus* Group. *Cribicollis* has oval, pad-like scales between the tarsal claws like those of *setosus*, *aeratus* and *celatus* n. sp. but differs from these three species in having remotely placed, very inconspicuous setae on the elytra. In this latter respect and in general appearance, *cribicollis* more closely resembles *limatulus*, *robustus* and *disgregus* n. sp.

Specimens of *cribicollis* have been collected by sweeping vegetation around water. One specimen seen from Kansas was collected on alfalfa.

Endalus cribicollis was described from Georgia. Blatchley (1916) reports the species from District of Columbia. A total of 10 specimens from the following localities has been examined: GEORGIA—type (Museum of Comparative Zoology). KANSAS—Riley Co. WYOMING—Cheyenne. TEXAS—College Station; Dallas; Gillespie Co.

Endalus limatulus (Gyllenhal)

Notiophilus limatulus Gyllenhal, 1836, p. 319.

Endalus limatulus, Laporte, 1840, p. 339; Leconte, 1876, p. 176; Blatchley and Leng, 1916, p. 224.

Length, 4.5–5.5 mm.; width, 2.0–2.5 mm.

This is the most widely distributed member of the *limatulus-setosus* Group in America north of Mexico. Examples of this species

exhibit considerable variation in size, length of rostrum, and degree of tapering of the apices of the elytra. Two Iowa specimens from the U. S. National Museum series have the rostrum more slender and longer, and the elytra more distinctly tapered apically than in any other specimens of *limatulus* examined. However, this variation does not appear to exceed that to be expected for such a widespread and rather variable taxon.

Tanner (1943) reports collecting *limatulus* on *Scirpus acutus* and *Typha latifolia* in Utah. The two Iowa specimens mentioned above each bears the pin label "*Scirpus acutus*", and at least one of these was reared from this plant. One specimen seen from Georgia is labeled "on *Aeschynomene virginica* stem" and another from North Carolina "on *Scirpus americanus* foliage". Bleasdel (1937) cites a report of *limatulus* ovipositing on *Juncus* sp. in Iowa.

The type of this species has not been located and there is considerable doubt that it is extant. It is not in the Gyllenhal collection at the Zoological Institute, Uppsala, Sweden.

Seventy-two specimens of *Endalus limatulus* have been examined from the following localities: *United States*. ARIZONA—Tucson; Douglas. COLORADO—Greely. GEORGIA—Richmond Hill. IDAHO—Parma. ILLINOIS—Buda. INDIANA—Whitley Co.; Lake Co. IOWA—Palo Alto Co.; Iowa Co.; Arnold's Park. KANSAS—Riley Co. MARYLAND—Chesapeake Beach. MICHIGAN—Detroit. MINNESOTA—Albert Lea. NEVADA—Humboldt L. NEW JERSEY—Irvington. NEW MEXICO—Albuquerque. NEW YORK—Staten Island; Bellport, L. I. NORTH CAROLINA—Ft. Fisher; Swan Quarter. OKLAHOMA—Norman. TENNESSEE—Knoxville. TEXAS—Gillespie Co. UTAH—Utah Lake, East side; St. George; Richfield. VIRGINIA—Hampton; nr. Cole Pt. *Canada*. ALBERTA—Medicine Hat. MANITOBA—Strathclair. ONTARIO—Pt. Pelee; Pr. Edward Co.

***Endalus disgregus*, n. sp.**

Holotype male: Length, 3.6 mm.; width, 1.4 mm.; width of pronotum, 1.1 mm.; length of pronotum, 0.96 mm.; length of rostrum, 0.81 mm.

Elongate-oval; derm black, fourth tarsal segment and apex of rostrum reddish, scape and first two segments of funicle testaceous, remainder of antenna distinctly darker; dense coating of scales on body predominately gray, with darker scales forming faint patterns on pronotum and elytra.

Rostrum moderately curved, depressed and slightly widened

toward apex; covered with dense coating of scales in basal two-thirds; punctation coarse at base, becoming finer apically, apex of rostrum shining, remotely and very finely punctate. Antennae inserted slightly behind middle; funicular segment 1 stout, approximately as long as next three segments combined, segment 2 almost as long as 3+4, segments 3-6 nearly equal in length, becoming progressively broader toward club, last two segments rather densely squamose. Club as long as preceding five funicular segments combined. *Eyes* broadly oval, slightly convex. *Prothorax* wider than long (30:26); sides evenly rounded, feebly constricted before apex; pronotum finely, densely punctate, with faint pattern of scales consisting of a median light gray area enclosed by darker, broad sub-lateral vittae, scales on lateral margins grayish. *Scutellum* small, densely covered with white scales. *Elytra* about 1.3 times wider, 2.4 times longer than prothorax, transversely depressed on disc at basal third; humeri rounded; sides of elytra parallel to about middle, thence converging to obtusely pointed apex; apices acuminate, divaricate; intervals flat, finely punctate, each bearing a feebly defined row of white, short, recurved setae; striae narrow, deeply impressed; scales brownish for a short distance at bases of intervals 2 and 3, in a spot behind humeri, in a vague V-shaped pattern at middle of elytra, and on declivity; scales elsewhere dirty gray. *Underside* covered with dense coating of gray scales which are lightly tinted with scattered spots of light brown; distinct concavity in middle of first abdominal sternum, fifth sternum with shallow oval depression in center. Femora and tibiae rather stout, tibiae each with a row of a few stout denticles along inner margin. Tarsal segment 3 slightly broader than 2; pad-like scales between claws elongate, plumose; tarsal claws slender, widely divergent.

Type material: Holotype male, OREGON, 10 mi. N. W. Klamath Falls, "in swamp", 16 June 1952, No. 54-10685 (V. Roth); and one male paratype, OREGON, Narrows, 1 July 1906, no other data. The paratype specimen closely resembles the holotype. It measures 3.5 mm. in length and 1.4 mm. in width. Both specimens are to be returned to the U. S. National Museum.

Remarks: This species closely resembles *limatulus* from which it may be separated by the narrower third tarsal segment, the more slender tarsal claws, and the smaller size. One damaged female from Carson, Nevada, in the U. S. National Museum series keys to *disgregus* on the basis of the narrow third tarsal segment. It differs from this species in being somewhat larger and having the elytra more strongly tapered toward the apex. This specimen is possibly the female of *disgregus*, but its identity must remain in question

until additional examples are available for study.

Endalus robustus Schaeffer

Endalus robustus Schaeffer, 1908, p. 217.

I have not examined specimens of *robustus*, a species apparently known only from the type material collected at Brownsville, Texas. The type is in the U. S. National Museum. Schaeffer's statement concerning the comparison of *robustus* with *limatulus* is as follows: "This species has a shorter elytra than the male of *limatulus*, a different shaped and more strongly punctate prothorax, a stouter, flatter beak and more widely separated eyes".

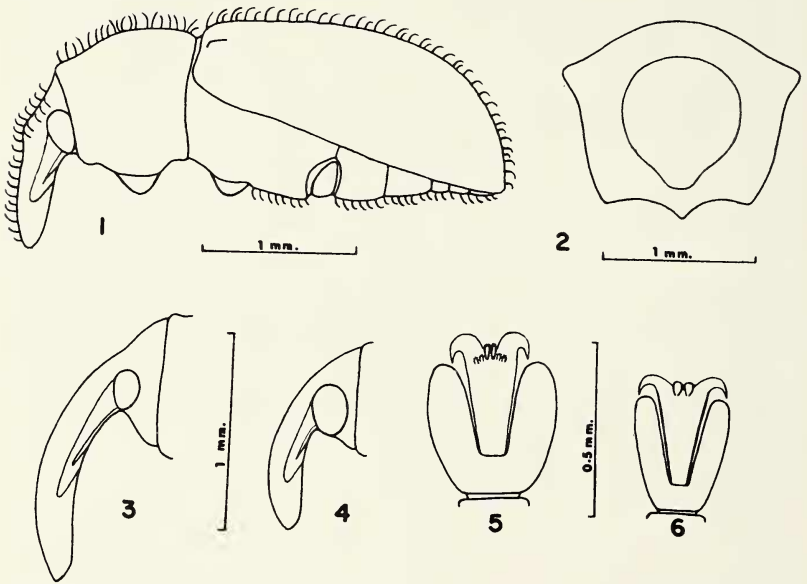


Fig. 1, Lateral outline of *Endalus celatus*, n. sp., holotype male. Fig. 2, Front view of prothorax of *E. setosus* LeConte, head removed. Fig. 3, Lateral view of head and rostrum of *E. cribicollis* LeConte, female. Fig. 4, Same of *E. aeratus* LeConte, female. Fig. 5, Ventral view of apical tarsal segments of *E. limatulus* (Gyllenhal) showing pad-like scales between claws. Fig. 6, Same of *E. setosus* LeConte.

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A SIMPLE METHOD FOR PREPARING UNIFORM MINUTEN-PIN DOUBLE MOUNTS

By B. V. PETERSON, J. W. McWADE and E. F. BOND¹

There are many advantages to using minuten pins for mounting small Diptera, or other small insects, in place of triangular points or the attachment of specimens to larger pins by some adhesive material. Uniform minuten-pin double mounts of a relatively small size are more useful and aesthetically pleasing than those of the usual array of various shapes and sizes.

We found the following procedure for preparing uniform and consistently neat minuten-pin double mounts both rapid and simple. We first cut discs, 5.0 mm. in diameter, from $\frac{1}{8}$ "-thick sheet cork with an eyelet punch (Fig. 1). No. 2 insect pins are then pushed through the center of each disc with pinning forceps. The cork discs will be automatically aligned at the proper height on the pins if the discs are placed on the uppermost stage of an in-

¹ Entomologist, Technician and Assistant Technician, respectively, Entomology Laboratory, Canada Department of Agriculture, Guelph, Ontario.